CLAIMS

What is claimed is:

1. In a jaw clutch for transferring rotational power from a driving rotatable member to a driven rotatable member, the jaw clutch including a first clutch plate connected to one of the rotatable members for rotation therewith and movement along a predetermined path relative thereto, and a second clutch plate connected to another of the rotatable members for rotation therewith adjacent to an end of the path, the clutch plates including teeth matingly engageable when the clutch plates are in abutment for connecting the clutch plates for joint rotation, and a clutch spring disposed for exerting a spring force against the first clutch plate for holding the first clutch plate at the end of the path in abutment with the second clutch plate, the clutch spring being yieldable to a disengagement force greater than the spring force applied against the first clutch plate in opposition to the spring force such that the first clutch plate will be moved along the path away from the second clutch plate and the teeth of the clutch plate connected to the drivingly rotated member will move in a ratcheting action over the teeth of the clutch plate connected to the driven rotating member to generate shock forces between the clutch plates having magnitudes substantially greater than magnitude of the disengagement force at time intervals which are a function of a relative speed of rotation of the clutch plates, an improvement comprising:

   a shock damper disposed in connection with the second clutch plate for absorbing a substantial portion of energy of the shock forces generated between the clutch plates and then releasing the energy so as to be at least partially dissipated by the clutch such that resulting portions of shock forces exerted against the rotating members will be damped so as to have maximum magnitudes equal to less than half of the magnitudes of the shock forces

generated between the clutch plates, while holding the second clutch plate substantially stationary adjacent to the end of the path.

2. In the jaw clutch of claim 1, the shock damper comprising a disk spring which is resiliently deformable from an initial shape to a deformed shape by absorbing the energy of the shock forces, and which will return to the initial shape by releasing the energy absorbed thereby.

3. In the jaw clutch of claim 2, the improvement further comprising the disk spring being operable in cooperation with the clutch spring for cyclically transferring at least a portion of the energy of the shock force between the clutch plates for dissipating the energy.

4. In the jaw clutch of claim 2, the improvement further comprising the disk spring having a predetermined spring rate several times greater than a spring rate of the clutch spring such that the disk spring will maintain the initial shape when the energy of the shock force is absent.

5. In the jaw clutch of claim 4, the improvement comprising the spring rate of the disk spring being at least ten times greater than the spring rate of the clutch spring.

6. In the jaw clutch of claim 4, the improvement comprising the spring rate of the disk spring being at lest fifteen times greater than the spring rate of the clutch spring.

7. In the jaw clutch of claim 4, the improvement comprising the spring rate of the disk spring being between about 30,000 and about 40,000 pounds per inch

and the spring rate of the clutch spring being between about 2000 and about 3000 pounds per inch.

8. In the jaw clutch of claim 4, the improvement comprising the spring rate of the disk spring being between about 35,000 and about 38,000 pounds per inch and the spring rate of the clutch spring being between about 2100 and about 2400 pounds per inch.

9. In the jaw clutch of claim 2, the second clutch plate and the rotatable member connected thereto being mounted on a sleeve supported on the rotatable member connected thereto in fixed relation to the end of the path, the sleeve including a shoulder extending therearound, and the improvement further comprising the disk spring being disposed between the rotatable member connected to the second clutch plate and the shoulder.

10. In a jaw clutch engageable for connecting a rotatable shaft and a rotatable member supported thereon for joint rotation about an axis of the shaft, the clutch being disengageable for allowing relative rotation of the shaft and the member, the clutch including a first clutch plate mounted on the shaft for rotation therewith and axial movement therealong, a second clutch plate mounted on the shaft and connected to the member for rotation relative to the shaft, the clutch plates having axially opposing teeth matingly engageable for joint rotation thereof, and a clutch spring disposed for applying an axial spring force against the first clutch plate for holding the opposing teeth in mating engagement, the clutch plates being movable apart by application of a disengagement force between the teeth such that the opposing teeth will rotate in ratcheting relation so as to alternatingly disengage and fully or partially matingly re-engage to exert axial shock forces against the clutch

plates having magnitudes several times greater than magnitudes of the spring force and the disengagement force, an improvement comprising:

a damper spring disposed between the second clutch plate and an element mounted at an axially fixed location on the shaft, the damper spring having a spring rate at least several times greater than a spring rate of the clutch spring so as to hold the second clutch plate in a substantially stationary axial position when only the spring force and the disengagement force are applied, and so as to absorb at least a substantial portion of energy of the shock forces exerted against the clutch plates and dissipate energy thereof in cooperation with the clutch spring and the clutch plates such that resultant axial shock forces exerted against the shaft will have maximum magnitudes of less than half the magnitudes of the shock forces exerted against the clutch plates.

11. In the jaw clutch of claim 10, the improvement comprising the spring rate of the damper spring being at least ten times greater than the spring rate of the clutch spring.

12. In the jaw clutch of claim 10, the improvement comprising the spring rate of the damper spring being at least fifteen times greater than the spring rate of the clutch spring.

13. In the jaw clutch of claim 10, the improvement comprising the spring rate of the damper spring being between about 30,000 and about 40,000 pounds per inch and the spring rate of the clutch spring being between about 2000 and about 3000 pounds per inch.

14. In the jaw clutch of claim 13, the spring rate of the damper spring being between about 35,000 and about 38,000 pounds per inch and the spring rate of the clutch spring being between about 2100 and about 2400 pounds per inch.

15. In the jaw clutch of claim 10, the damper spring comprising a disk spring.

16. In a jaw clutch mounted on a shaft rotatable about an axis therethrough, the clutch including a first clutch plate mounted on the shaft for rotation therewith and axial movement therealong, a second clutch plate mounted on a sleeve around the shaft and connected to a rotatable member for rotation about the shaft, the sleeve having a shoulder therearound at a predetermined axial location, the clutch plates having axially opposing teeth matingly engageable for connecting the shaft and the member for driven rotation of one by the other, and a clutch spring disposed for applying an axial spring force against the first clutch plate for holding the opposing teeth in mating engagement, the clutch plates being movable axially apart by application of a disengagement force between the teeth resulting from resistance to rotation of the driven one of the shaft and the member such that the opposing teeth will rotate in ratcheting relation wherein the teeth cyclically disengage and fully or partially matingly re-engage so as to exert axial shock forces against the clutch plates having magnitudes several times greater than magnitudes of the spring force and the disengagement force, respectively, an improvement comprising:

a resilient shock damper disposed between the second clutch plate and the shoulder, the damper having a spring rate sufficiently greater than a spring rate of the clutch spring so as to hold the second clutch plate substantially axially stationary when only the spring force and the disengagement force are applied, and so as to absorb energy of the shock

forces exerted against the second clutch plate and release and redirect the energy through the clutch plates to the clutch spring so as to be at least partially dissipated such that any resulting shock forces exerted against the shaft will have magnitudes substantially less than magnitudes of the shock forces exerted against the clutch plates.

17. In the jaw clutch of claim 16, the damper comprising a disk spring which is resiliently deformable from an initial shape to a deformed shape by absorbing the energy of the shock forces and which will return to the initial shape by releasing the energy absorbed thereby.

18. In the jaw clutch of claim 17, the improvement further comprising the disk spring being operable in cooperation with the clutch spring for cyclically transferring at least a portion of the energy of the shock forces to the clutch plates for dissipation by relative movement thereof.

19. In the jaw clutch of claim 16, the improvement comprising the spring rate of the disk spring being at least ten times greater than the spring rate of the clutch spring.

20. In the jaw clutch of claim 16, the improvement comprising the spring rate of the disk spring being at least fifteen times greater than the spring rate of the clutch spring.

21. In the jaw clutch of claim 16, the improvement comprising the spring rate of the disk spring being between about 30,000 and about 40,000 pounds per inch and the spring rate of the clutch spring being between about 2000 and 3000 pounds per inch.

22. In the jaw clutch of claim 16, the spring rate of the disk spring being between about 35,000 and about 38,000 pounds per inch and the spring rate of the clutch spring being between about 2100 and about 2400 pounds per inch.